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Why Alfalfa Fails

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By
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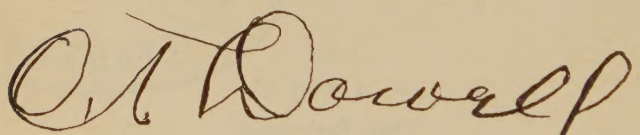
Experiment Station Circular No. 64.

It will be noticed that Dr. Rolfs has written this circular as if it were a letter. A word of explanation is needed. The circular is a copy of a letter that was sent in reply to a letter asking why alfalfa dies out or fails in Oklahoma. Dr. Rolfs has indicated that the failure of alfalfa in some sections of this state during the last few years is due to many causes. I would call your particular attention to these causes and to the remedy that Dr. Rolfs suggests.



Dean and Director.

Why Alfalfa Fails

October 19, 1927.

Dear Sir:

Your letter to the Experiment Station in regard to the killing out of alfalfa in this state came to hand several days ago. The A. and M. College has given this condition considerable attention during the past three years. The trouble is not due to a particular condition or thing, but to a combination of soil and weather conditions, aided more or less by animals, insects and plant parasites.

However, the soil and weather appear to be the two important factors in bringing this about. The alfalfa is a deep rooted and vigorous growing plant, so naturally the crop does best on land that has a deep subsoil which is rich in plant food and supplied with an abundance of available soil moisture. In earlier days only our best bottom lands were planted to alfalfa but the growers soon discovered that during most seasons nearly all the bottom lands would produce profitable crops. Even some of the upland farms were finally planted to alfalfa. While the land was new and free of most of the parasites, the fields produced profitable crops for a period of years without killing out, but as the pests multiplied the period for profitable production was gradually shortened.

The gopher is one of the most active agents in killing out the alfalfa stands, although the stem nematoeds, root knot nematodes, grasshoppers, web worms, and leaf hoppers also aid in bringing about this condition. While the insect pests frequently become so numerous as to kill out a stand the plant parasites, bacterial wilt, bacterial blight, anthracnose, black scurf, stem rot and leaf spot organisms have also accumulated to such an extent that they too take an annual toll from the crop. All the pests seldom occur in a single field, yet if the crop is grown continuously on the same land or is changed for too short intervals, most of the pests finally find their way to the field.

During normal seasons the growth of the infected plants is usually sufficiently vigorous to supply the needs of the plant as well as those of the parasites and in some cases to also produce a fairly large crop of hay. However, during periods of adverse weather conditions the soil moisture is gradually lost and the activity of the plant slows down and its power of resistance materially weakened, but most of the parasites continue to multiply and consume more and more of the plant's tissues, finally killing the plant. It is evident that in most cases the plants growing on the rich bottom lands are better able to repair and overcome such invasions than those on the higher and dryer lands.

Some of these parasites also remain active during the warm periods in winter while the plants are inactive. The injury from such infections is equally disasterous to both bottom and upland plants. Frequently fields apparently normal in the fall lose from twenty-five to thirty per cent of the plants during the winter months due to the work of the parasites. Such injury is usually attributed to the freezing weather and is spoken of as "winter killing."

The tissues of the roots and crown of the plants are sometimes severely injured by freezing weather. However, most of the injured plants recover quickly if the weakened tissue is not invaded by numerous parasites. Infections following such injury often result in a condition known as crown or heart rot. Running stock on frozen alfalfa fields and harrowing and discing the plants in spring also injure the crowns and open the way for the crown

rot parasites. While injury of this sort seldom results in the immediate death of the plants, yet such plants are weakened and seldom produce a full crop. Under certain soil and weather conditions the plants are actually frozen to death. While this occurs only occasionally it is one of the factors which complicates the solution of the problem. The lifting or freezing out of the fall sown seedling plants due to the action of frost in the wet heavy soils sometimes ruins a stand.

Infection of most plant parasites usually starts from a single point or plant and as the parasites multiply they spread more or less equally in all directions from the point of infection, so at first the diseased plants appear in more or less circular areas, but with the aid of the disc, mower, rake, loader, bailer, and the huller as well as the methods of storing and feeding of the hay, the various infected parts of the plant are gradually scattered about and the disease soon appears in all parts of the field. Wind, rain and water are also important agents of dissemination. Each parasite has its own peculiar habits and life history so in order to combat them successfully their habits must be studied and a complete record of their life histories worked out. Each presents a distinct problem. Fortunately the life history of most of them has been worked out. However, several of the pests are new to science and their life history is not as yet complete, but the work has advanced far enough to be of considerable practical value. The pests have specialized food habits and most of them can live only on the alfalfa plant.

Nearly all of our bottom lands are well adapted to alfalfa culture and failure in most cases can be attributed to the growing of the crop for too long a period on the same land. The long continued use of land for the growing of any crop depletes the soil of the food elements necessary for the satisfactory growth of that crop and tends to ruin the physical conditions of the soil. Under such cultural methods the alfalfa plants naturally weaken and fall an easy prey to insect and plant parasites. A proper change in crops not only increases the productive power of the soil, but also starves out the parasites. Modern transportation and farm practices have greatly facilitated the spread of the pest so it is no longer profitable to grow alfalfa continuously on the same land for more than five or six years.

Since most of the alfalfa pests live exclusively on the alfalfa plant the easiest practical way to eliminate them is to starve them out. This can be done by changing abruptly to some other crop. It has been found that the pests can not live on the various grain or fibrous-rooted plants. However, most of them can exist for some time on the dead alfalfa roots and stems left in the field; consequently the length of time required to rid the field of most pests depends largely on the time required to rid the field completely of all living and dead alfalfa material. This will usually take about three years, and in some cases even longer. All volunteer plants must be completely killed out during the spring of the first year. If all dead alfalfa roots and stems are completely decayed by the end of the second year the parasites will have been starved out by the fall of the third year and it will be safe to reseed the land to alfalfa.

Clean seed, planted on good bottom land that has been planted to grain or other fibrous-rooted plants for three years will practically rid the alfalfa of the various parasites and materially increase the yield. The length of profitable production will vary more or less according to cultural methods and proximity of the field to other alfalfa fields, but six years is about the present limit for profitable alfalfa production.